In this instrument the alternations in brightness at any point in the field when the slide is moved are beats due to the Doppler effect just as truly as are those heard in the second form of Koenig's experiment.

ALBERT B. PORTER.

CHICAGO,
January 14, 1905.

NOTE ON THE BROAD WHITE FISH.

IN the *Proceedings* of the American Philosophical Society of Philadelphia, XLIII., 1904, p. 451, plates VIII. and IX., I have wrongly identified the broad white fish, or *Coregonus kennicotti* Jordan and Gilbert, as the humpback, or *Coregonus nelsonii* Bean. My error was due largely to lack of material, ignorance of the species from autopsy, and the fact, as I have since discovered, that *C. nelsonii* does not always exhibit the well-developed hump like that of the type. Possibly when the Siberian forms are carefully studied the nomenclatures of these fishes will be more stable.

HENRY W. FOWLER.

ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA, February 5, 1905.

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*RECENT ZOOPALEONTOLOGY.**

DURING the past thirteen years great advances have been made in our knowledge of the ancient mammalian life of North America, especially through the explorations in the Rocky Mountain region carried on by the Carnegie, Field Columbian and American Natural History Museums. The long Tertiary period has been clearly subdivided into a series of stages and substages. This enables paleontologists to record more accurately than ever before the time of arrival and departure of the larger and smaller quadrupeds from North and South America, Asia, Europe, Africa, and to determine more precisely when the connection of North and South America was interrupted by a gulf flowing between the Atlantic and Pacific Oceans, and when the connection was again made by the elevation of the Isthmus of Panama; this demonstrates also that a very much closer connection existed between the animal life of Europe and of North America through continuous intermigration over the broad land area now submerged beneath the Behring Straits. A series of six world maps prepared by Dr. W. D. Matthew clearly exhibit this submergence and emergence of the isthmuses between these great continents.

Of especial interest is the recent discovery by the Geological Survey of Egypt that the whole race of mastodons and elephants originated in Africa, entered Europe in the middle of the Tertiary and soon afterward found their way into North America and somewhat later into South America. We have now been able to fix very positively the date of actual arrival of these animals in North America. It appears probable that successive waves of migrations of European and Asiatic species of elephants and mammoths came to this country. In the meantime there survived here from one of the earliest African migrants the eastern American forest mastodon which lived until comparatively recent times.

The theory of multiple races or polyphyletic evolution not only of elephants but of horses, rhinoceroses, camels and titanotheres appears to be clearly established through these recent discoveries. It was formerly believed, for example, that the modern horse had a single line of ancestors extending back into the Eocene period; now it appears that in North America there were always four to six entirely different varieties of the horse family living contemporaneously, including slow-moving, forest-living horses with broader feet, and very swift plains-living horses with narrow feet fashioned more like the deer. Intermediate between these arose the variety which survived and gave rise to the true modern horse. Furthermore, it appears that the modern horses separated from the asses and zebras at a much more remote period than has been generally supposed, and we are now endeavoring to ascertain accurately when this separation occurred.

The same discovery of multiple races has been made among the rhinoceroses. In Eu-

* Abstract of a lecture delivered by Professor Osborn before the Society of Naturalists at the Philadelphia meeting.